VTI TECHNOLOGIES

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SCA8X0-21X0-3100
Demo Kit User Manual

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1 Introduction

SCA8X0-21X0-31X0 Demo demonstrates digital SCA8x0, SCA21x0 and SCA31x0 accelerometer family functionality and the component key properties. This document describes how to install the required software and how to use the SCA8X0-21X0-31X0 demo board and Graphical User Interface (GUI) software version 1.3.

SCA8X0-21X0-31X0 Demo consists of:

- SCA8x0, SCA21x0 or SCA31x0 sensor soldered on chip carrier PWB (see figure 1 on the next page)
- USB interface card (see figure 1 on the next page)
- USB cable
- GUI software and USB drivers on a CD for a Personal Computer
- User manual for SCA8X0-21X0-31X0 demo kit

SCA8X0-21X0-31X0 Demo runs on Windows XP and 2000, it requires USB connection for data transfer. Demo is powered from USB port.

2 Quick start for using the SCA8X0-21X0-31X0 DEMO KIT

Please follow the steps below:

1. Insert CD-ROM
2. Setup the hardware
   - Connect the hardware to PC's USB port
3. Install the USB driver, after the PC has found the device
   - When the PC detects the new USB device, do not let Windows to detect the driver, address the USB driver from folder:
     `"CD-ROM\SCA8X0-21X0-31X0 demo - Virtual Com Port Drivers\"`
4. Install the GUI software
   - Install the GUI software by running the "`setup.exe`" from folder:
     `"CD-ROM\SCA8X0-21X0-31X0 demo - ver 1.0 – Installer\"`
   - Do not change the installation destination
5. Start the GUI software
   - From Start → Programs → SCA8X0-21X0-31X0-DEMO

When using the SCA8X0-21X0-31X0 DEMO KIT with GUI software:

- The DEMO KIT should be connected to PC before the GUI software is started
- Exit the GUI software before unplugging the DEMO KIT from PC
- After GUI software is stopped, the DEMO KIT can be unplugged from PC (DEMO KIT uses virtual serial port driver, so it can not be found as a USB device).

3 Hardware

The SCA8X0-21X0-31X0 DEMO KIT USB interface board (black PCB) and SCA8X0-21X0-31X0 PWB (red PWB) are shown in figure 1. The USB interface card converts the USB interface to SPI interface of the accelerometer. SCA8x0, SCA21x0 or SCA31x0 sensor is soldered on the PWB which is connected to interface board.

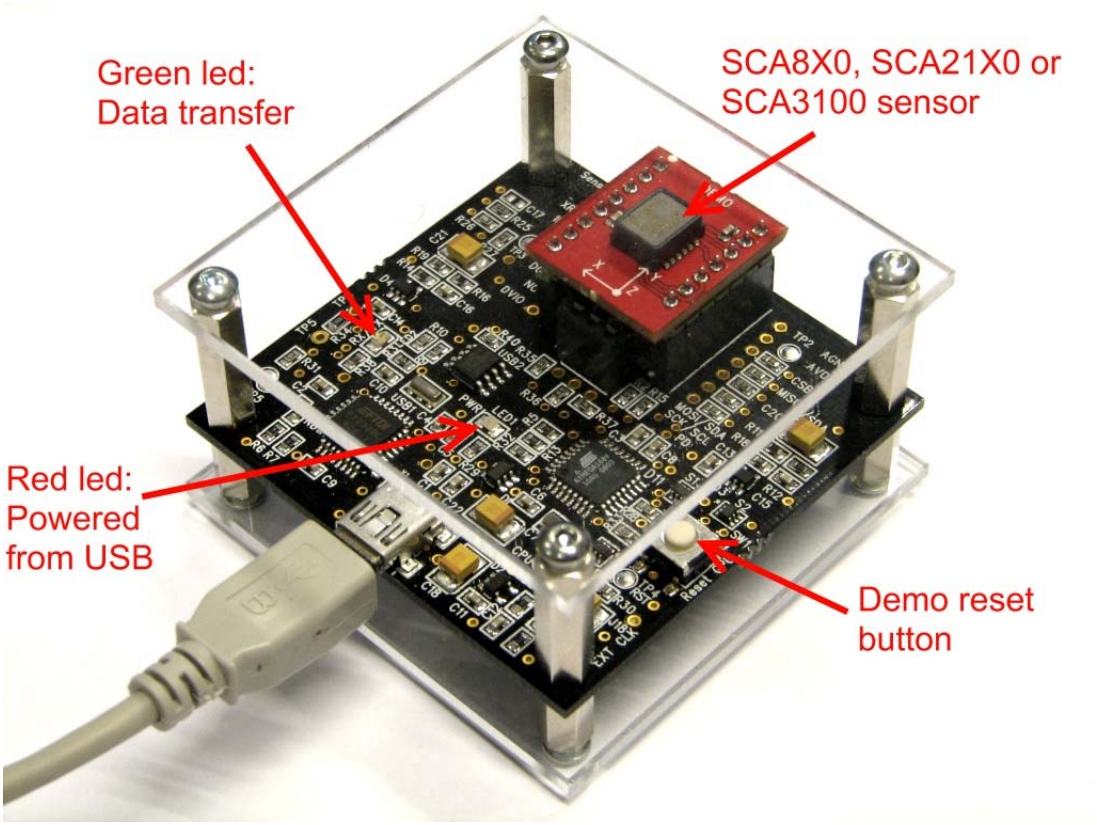


Figure 1. SCA8X0-21X0-31X0 demo USB interface board and SCA8X0-21X0-31X0 PWB.

4 GUI software

SCA8X0-21X0-31X0 DEMO KIT is controlled via USB serial port by GUI software. The software must be installed into location that is suggested during installation procedure.

The GUI software has several different display modes depending on the installed accelerometer on the PWB. The GUI displays and start up screens are presented below.

Screen capture of the GUI is presented in Figure 2.

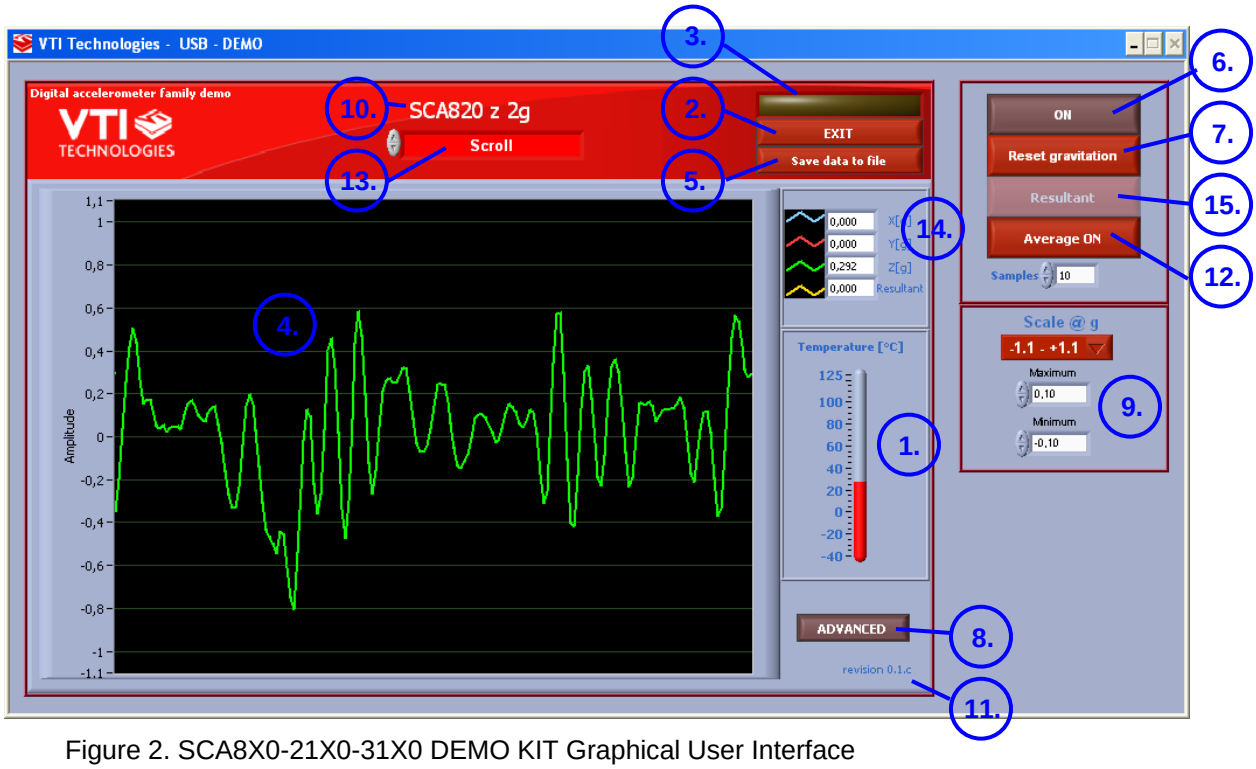


Figure 2. SCA8X0-21X0-31X0 DEMO KIT Graphical User Interface

Table 1. The numbered items in Figure 2.

Item	Description
1	Temperature display.
2	Exit software, [Esc]-button also.
3	Data overflow; if the indicator is yellow, the acceleration register has an overflow → measured acceleration is out of measuring range.
4	Scrolling acceleration display.
5	Save acceleration data in to a text file.
6	Freeze image, start / stop the scrolling window, [Page-Up] button also.
7	Zero gravitation ON / OFF.
8	Open / close the window extension with arrow button (available only in SCROLL display).
9	Pull down menu for acceleration [g] range (Y-axis).
10	Selected sensor type.
11	GUI software version number.
12	Averaging ON / OFF, number of samples for averaging.
13	Pull down menu for GUI display mode
14	Measured acceleration as a decimal number
15	Resultant vector ON/OFF in a 3 axis accelerometer

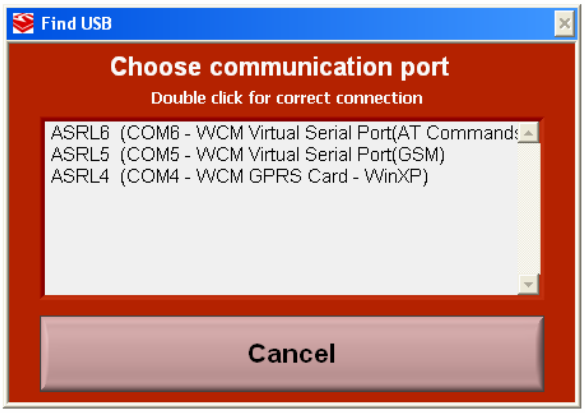

Find USB
Choose communication port
Double click for correct connection
ASRL6 (COM6 - WCM Virtual Serial Port(AT Commands
ASRL5 (COM5 - WCM Virtual Serial Port(GSM)
ASRL4 (COM4 - WCM GPRS Card - WinXP)
Cancel

Figure 3. USB serial port selection pop-up window.

If more than one USB serial port devices are connected to PC, user must select the correct **USB SERIAL PORT** from pop-up window (Figure 3.). If user does not know the correct USB serial port number, please disconnect all other USB serial port devices from PC and restart the GUI software.

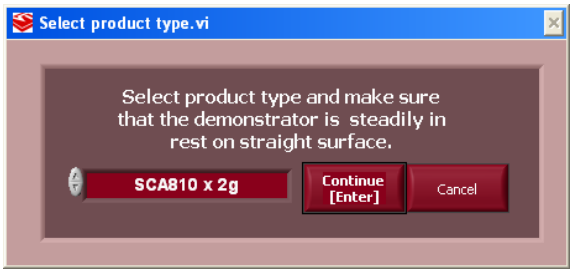

Select product type.vi
Select product type and make sure that the demonstrator is steadily in rest on straight surface.
SCA810 x 2g
Continue [Enter]
Cancel

Figure 4. Product selection pop-up window.

User needs to select the correct product type from **PRODUCT SELECTION** pop-up window (Figure 4). "SCA810 x 2g" is selected by default, product type can be changed from the list that appears when pressing the mouse left button the already selected product.

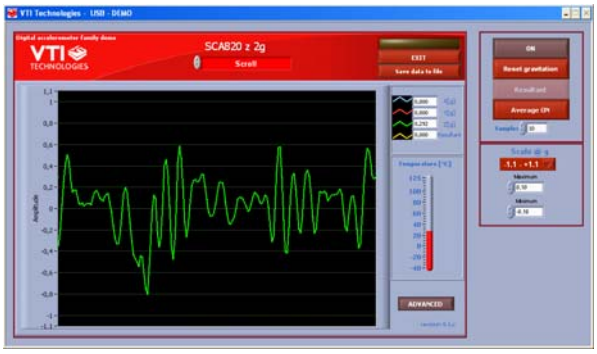


Figure 5. Scroll display.

SCROLL, continuously scrolling X / Y / Z / resultant accelerations (product dependent), see Figure 5. Acceleration is presented in [g]. User can:

- change the acceleration scale
- freeze the scrolling image
- set averaging OFF
- change the averaging factor
- save acceleration data into file
- enable resultant scrolling
-

Most of the actions/controls listed above are in the extension part of the window, which can be accessed by pressing the "ADVANCED" button (see Figure 2 and Table 1).

Figure 6. Bubble level display.

BUBBLE LEVEL, two displays that show tilt angle, see Figure 6. Angle calculation is performed in GUI, not in the accelerometer.

Display available only with SCA31x0 products.

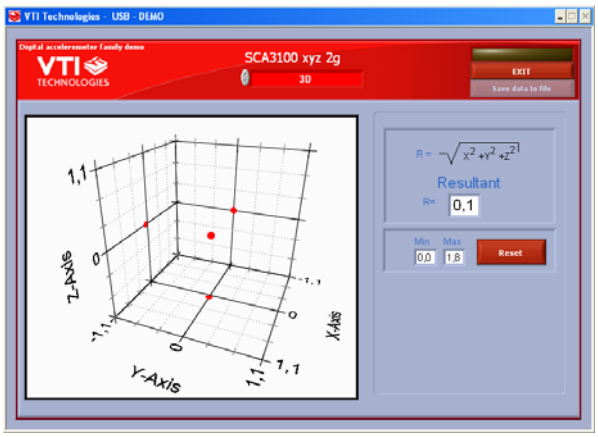


Figure 7. 3D display.

3D, 3 dimensional display with projections of each axis acceleration, see Figure 7.

The minimum and maximum resultant accelerations as well as the current resultant acceleration are displayed on the right side of the graph. Minimum and maximum displays can be cleared by pressing the "Reset" button.

Display available only with SCA31x0 products.

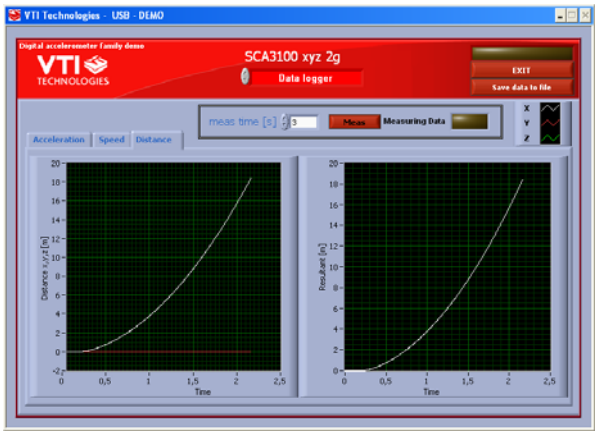


Figure 8. Data logger display.

DATA LOGGER, display where user can:

- log data (maximum log time 5 s)
- view the logged data in [g]
- view the demonstrator speed as a function time (speed [m/s] is derived by integrating the acceleration data)
- view the inertial navigation results (distance [m] as a function of time is derived by integrating the acceleration data twice)

Display available only with SCA31x0 products.

To start the data logging press the "Start measurement" button. The actual data logging starts when the yellow "Measuring data" indicator lights up in the upper right corner of the window. Data is logged for predefined time period (“Measure time”). The results are calculated afterwards.

The resultant (acceleration [g], speed [m/s] and distance [m]) is calculated from the respective 3-axis results as follows:

$$Res = \sqrt{x^2 + y^2 + z^2}$$

Please notice that inertial navigation contains six degrees of freedom and 3-axis accelerometer can handle only three degrees of freedom (rotations and tilting can not be detected when inertial navigation is performed only by 3-axis accelerometer).

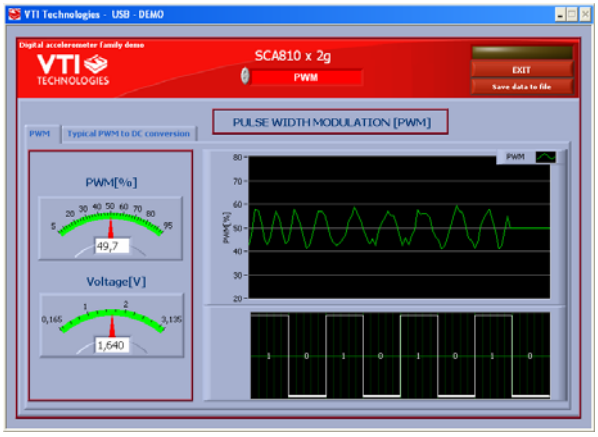


Figure 9. PWM display.

PWM (pulse width modulation) view shows the SCA8x0 output in PWM and simulated analog format. PWM(%) display shows the PWM output as 0/1 ratio in % and calculated analog output level.

The view is available for SCA8x0 product versions that have the PWM output.

Figure 10. Self test display with SCA8x0 product.

SELFTEST view shows the SCA8x0 output and GFC bit status over time during the self test. In the display the user can:

- start the self test (single cycle)
- vary the direction to which the sensing element is deflected during the self test

To start the self test press the "START SELFTEST" -button. After the self test the actual output waveform is displayed on the screen.

Figure 11. Self test display with SCA21x0/31x0 product.

SELFTEST view shows SCA21x0/31x0 output when the continuous self test has been switched on. In the display the user can:

- start the continuous self test
- read the self test status
- reset the product
- change the product offset

To start the self test press the "START SELFTEST" -button.

Figure 12. Register configuration display.

REGISTER CONFIG display offers user access in to accelerometer internal registers. Registers can be read and written. The written data format can be changed between binary and hexadecimal by pressing the "Bits / Hex" button.

User can read automatically all configuration registers by pressing the “Save reg content” button. The results are saved into file and they can be viewed from “Register content” tab as well.

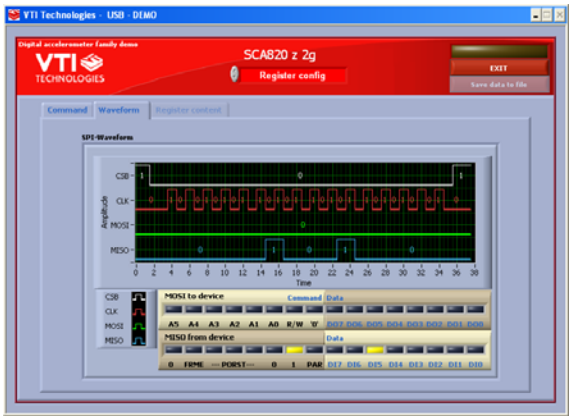


Figure 13. SPI waveform display.

SPI frame format for each operation can be viewed from “Waveform” tab (see Figure 12).

Figure 14. Reset demo display.

RESET DEMO initialises the GUI software. µC software version is presented also. SCROLL display opens after RESET by default.

4.1 Resetting GUI and µC

SCA8X0-21X0-31X0 DEMO KIT GUI software can be reinitialised by selecting the “Reset demo” display from pull down menu.

µC can be reinitialized by exiting from the GUI and then pressing the reset button (figure 1) on USB interface board.

4.2 Uninstalling the GUI and USB driver

GUI software and USB driver (FTDI Serial Converter Driver) can be removed from Windows Control Panel Add/Remove Programs.

5 USB interface board circuit diagram

SCA8X0-21X0-31X0 demo USB interface board circuit diagram is presented in following pages.

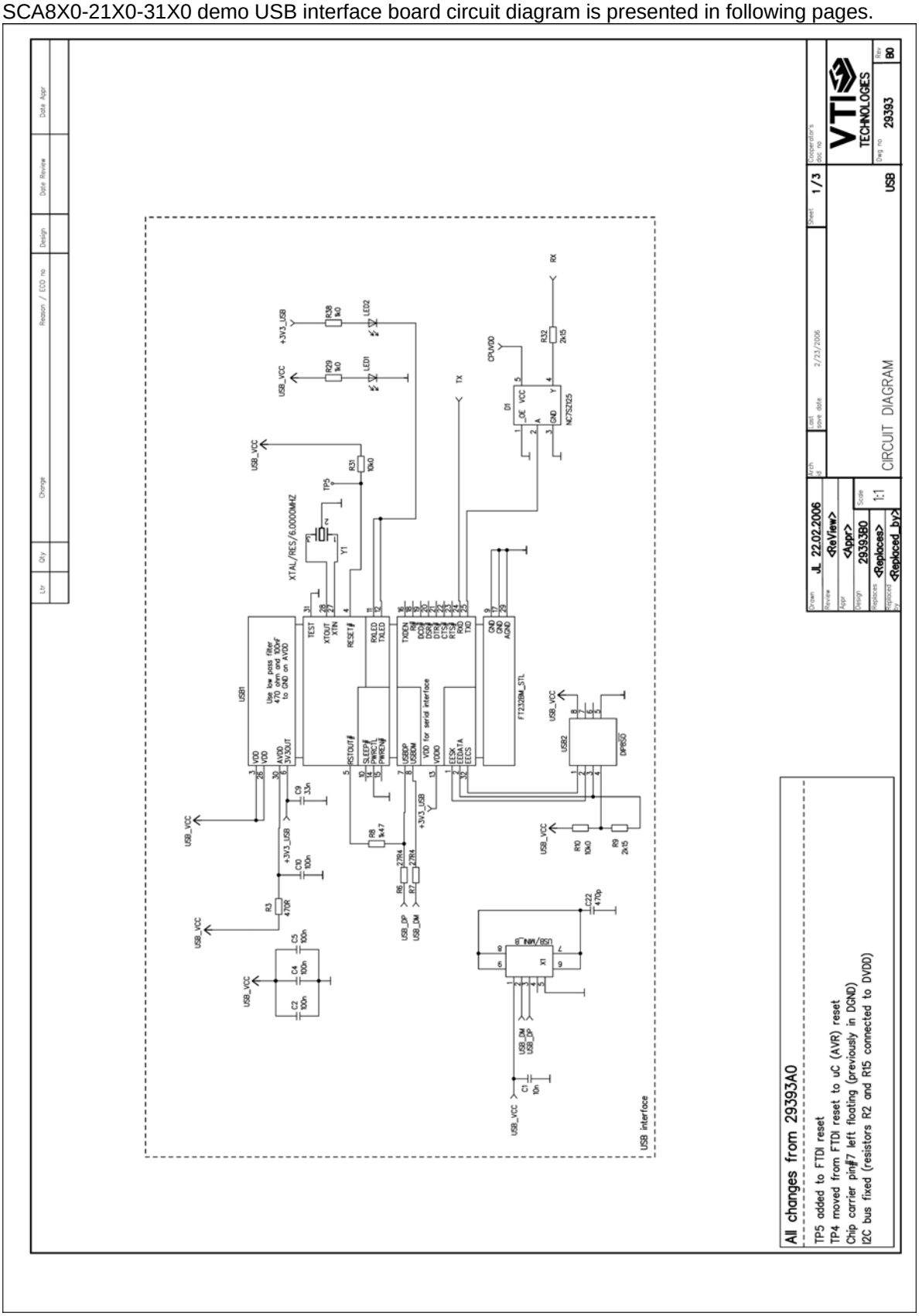


Figure 15. SCA8X0-21X0-31X0 DEMO KIT USB interface board circuit diagram (sheet USB).

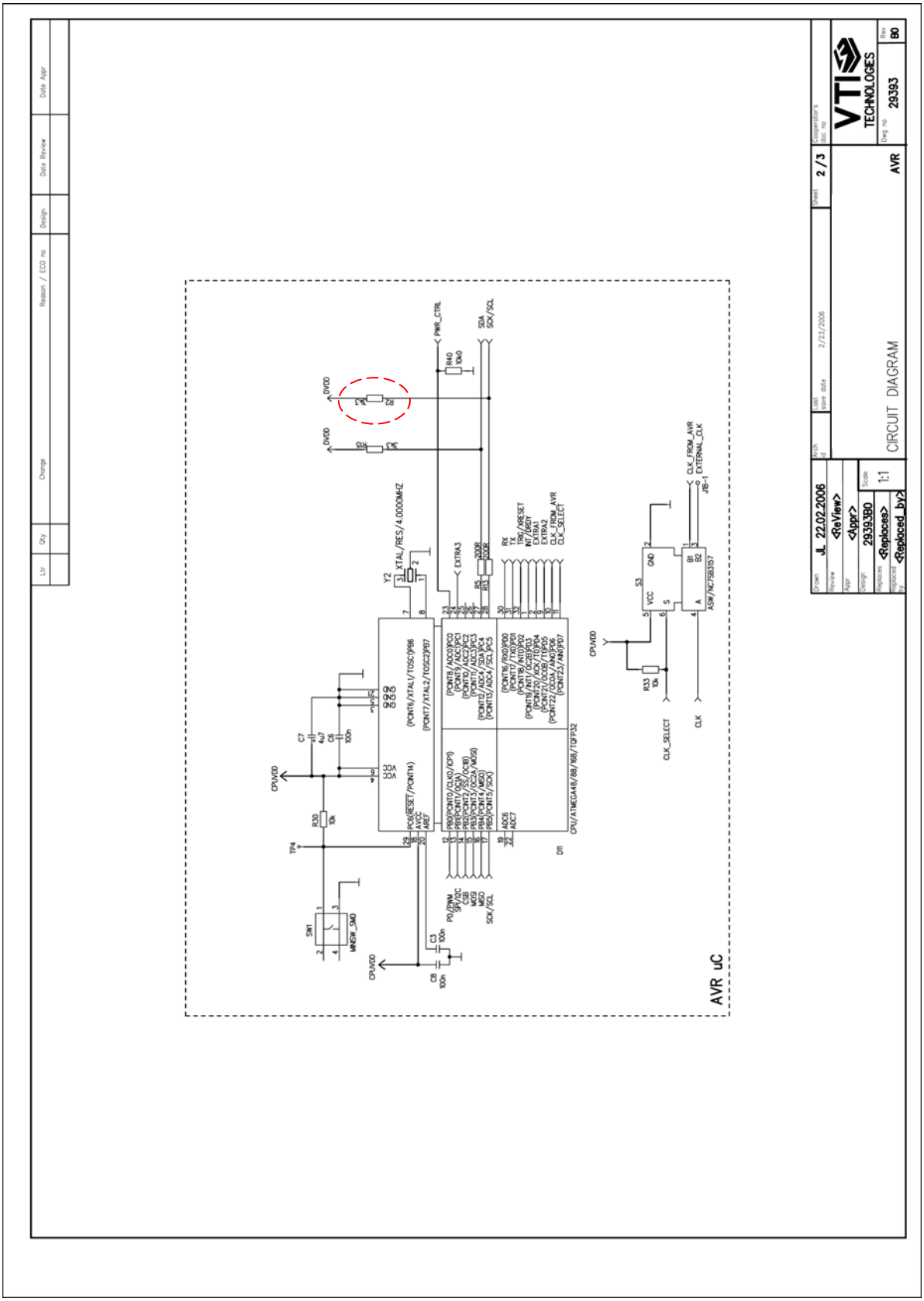


Figure 16. SCA8X0-21X0-31X0 DEMO KIT USB interface board circuit diagram (sheet µC).

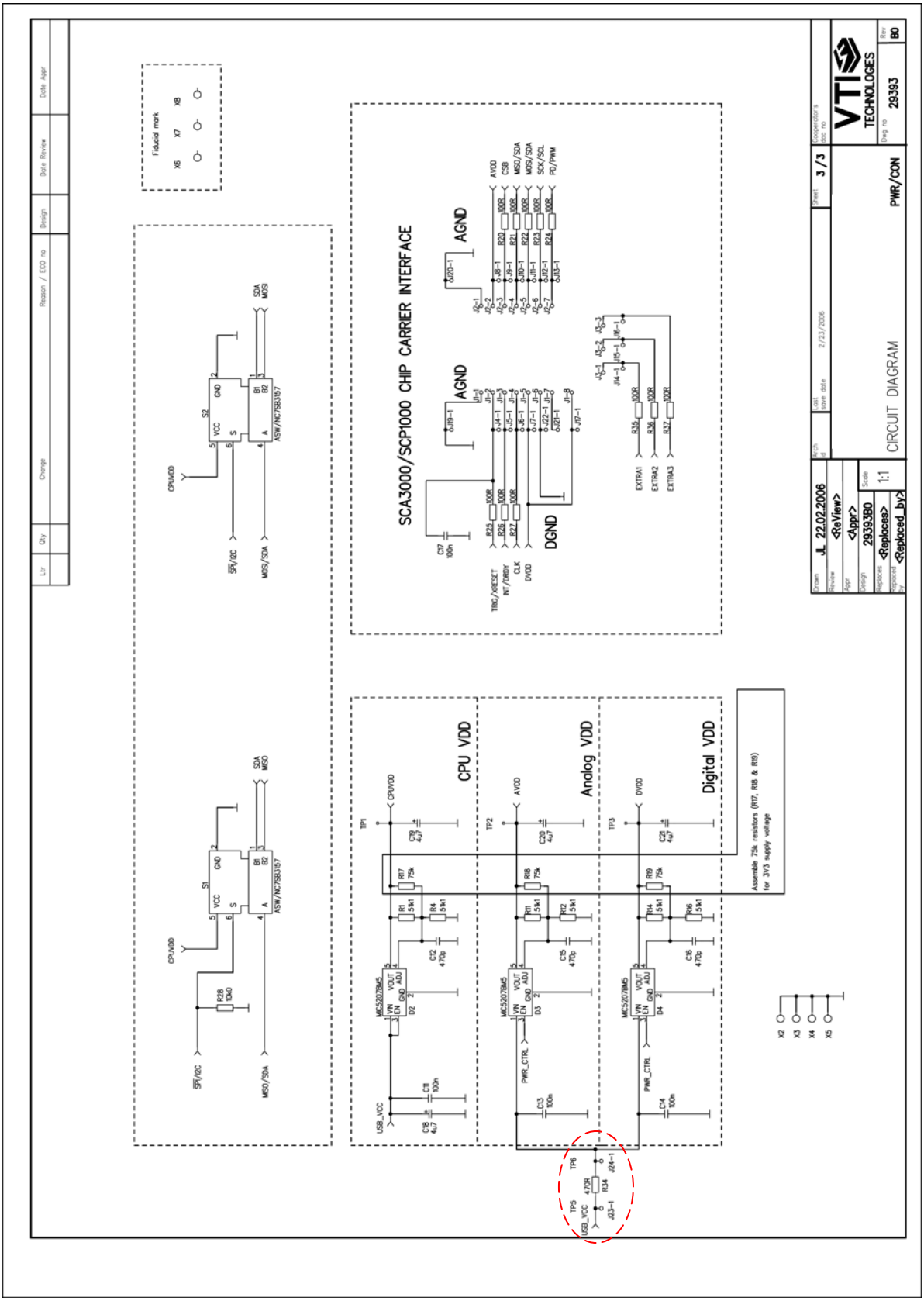


Figure 17. SCA8X0-21X0-31X0 DEMO KIT USB interface board circuit diagram (sheet power, resistor R34 is 0 ohm instead of 470 ohm described in the schematics).

6 USB interface board PWB layout

SCA8X0-21X0-31X0 DEMO KIT USB interface board PWB layout and silkscreen is presented below.

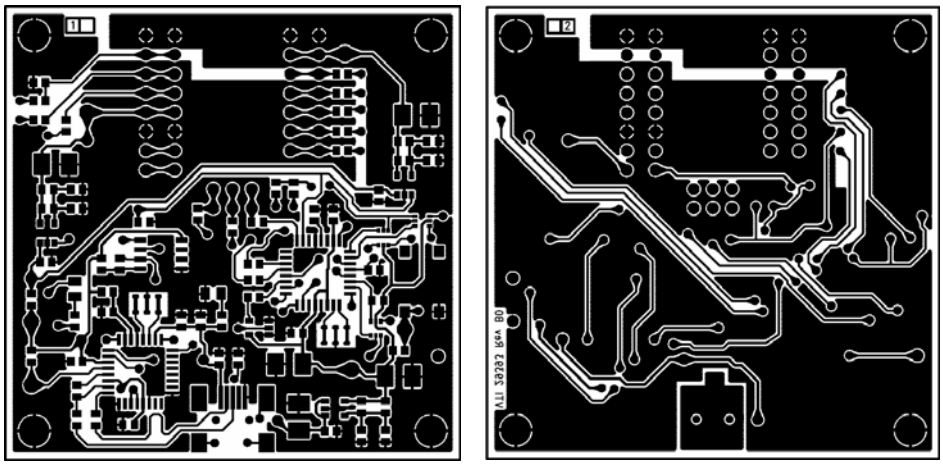


Figure 18. SCA8X0-21X0-31X0 DEMO KIT USB interface board PWB layout.

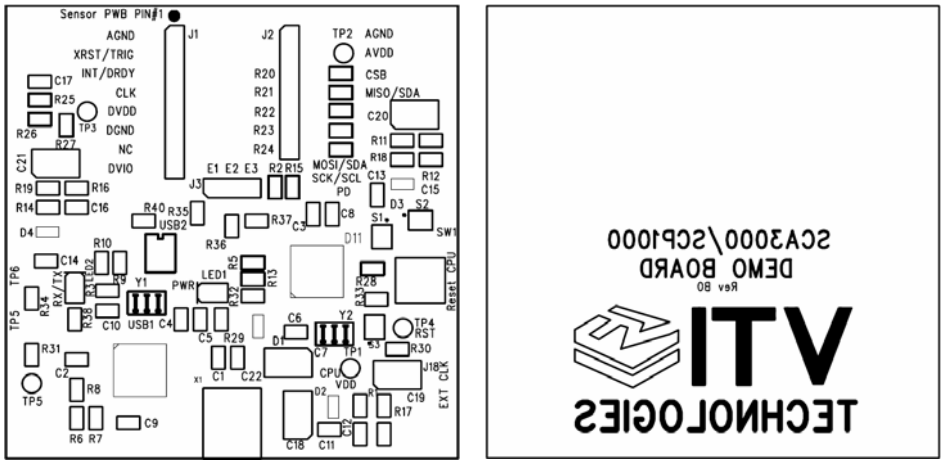


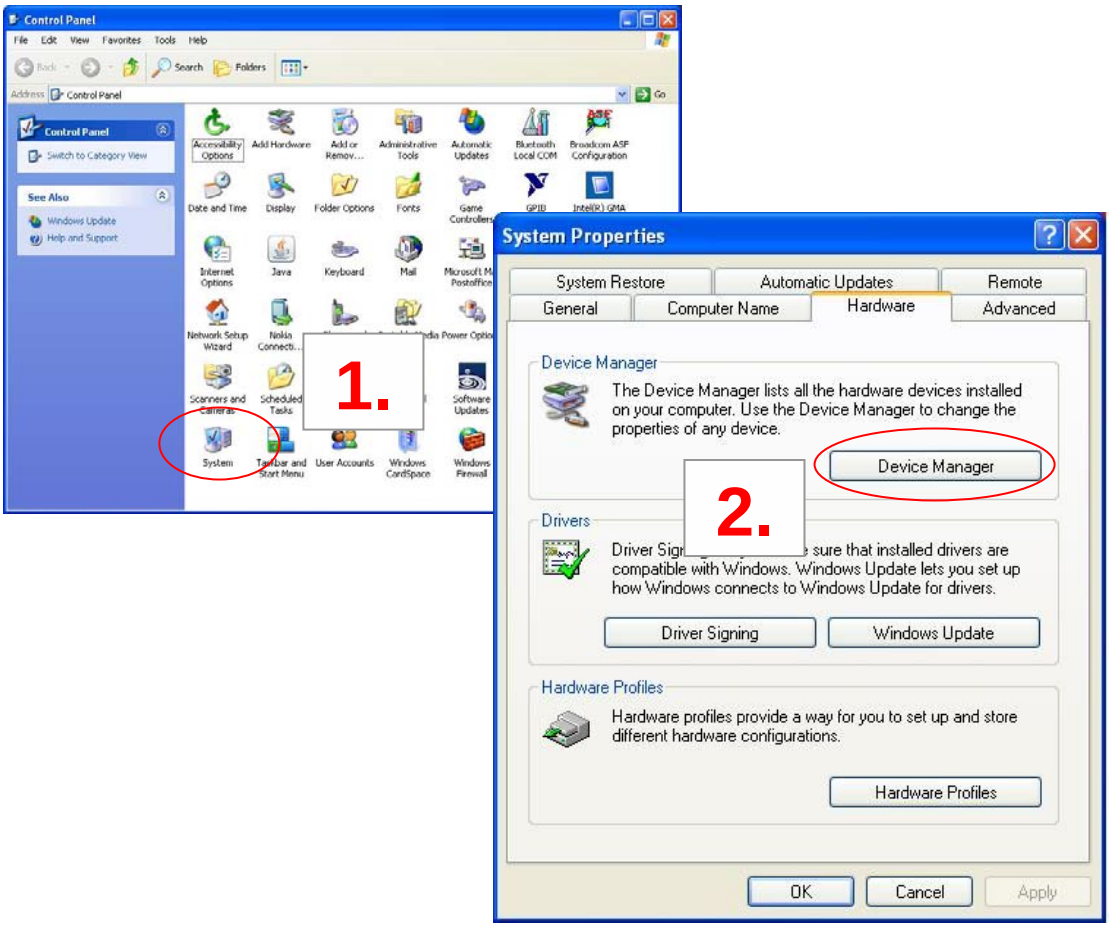
Figure 19. SCA8X0-21X0-31X0 DEMO KIT USB interface board

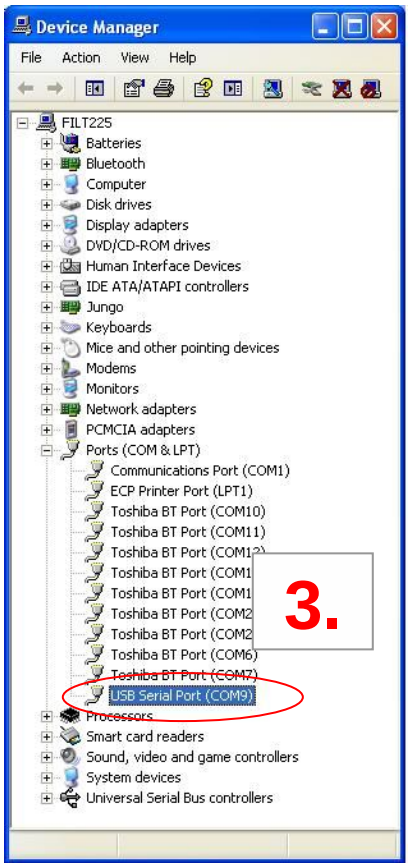
7 Troubleshooting

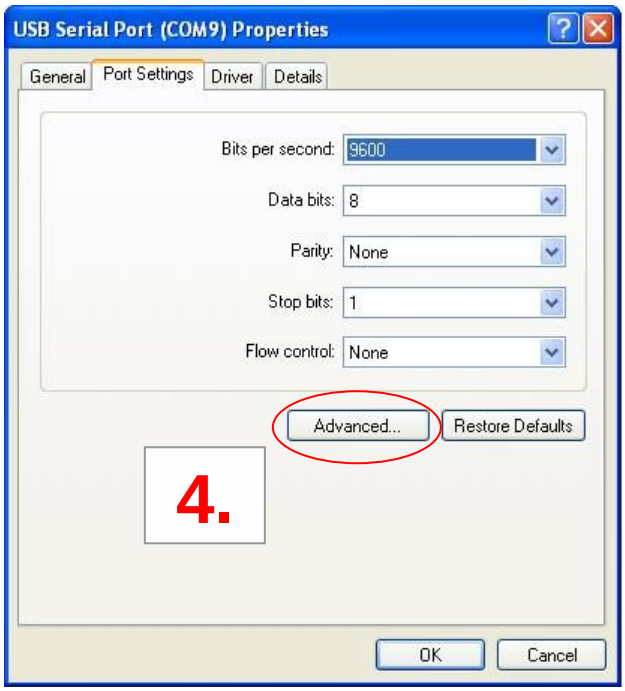
Due to many PC environments, the interoperability can be limited. The SCA8X0-21X0-31X0 DEMO KIT has been tested with DELL laptops (Latitude D600, D610, D410) and desktop PCs with Win2000 and WinXP operating system. If the SCA8X0-21X0-31X0 DEMO KIT does not work properly or it's operation is limited, the following items may help to sort the problems out:

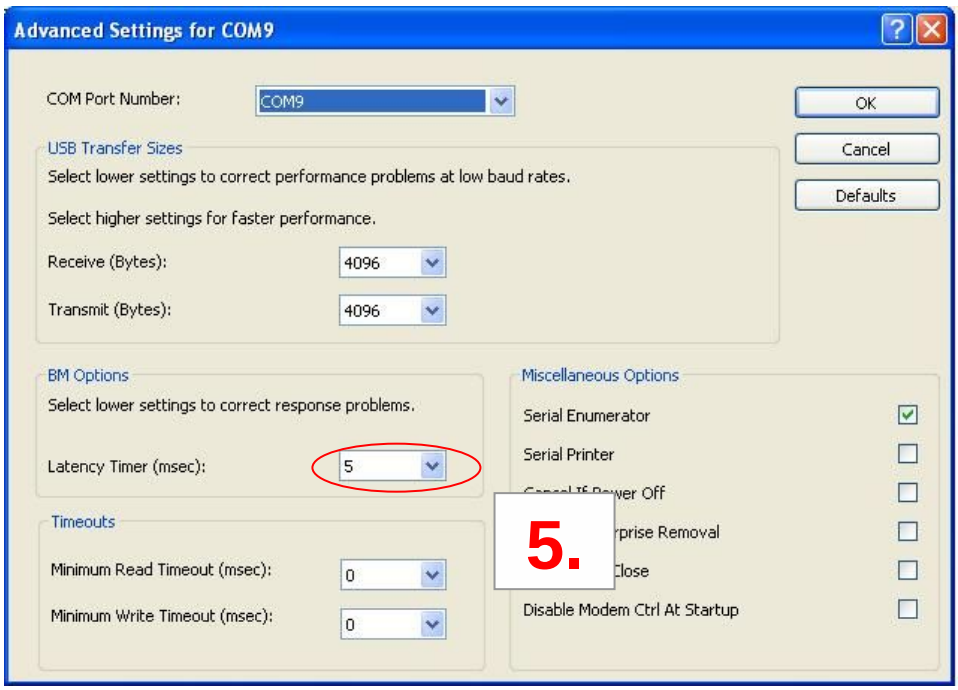
- Stop the GUI software, press the reset button program on demo USB interface board (see figure 1), re-start the GUI again.
- The wait time in data transfer can be in increased on "SETUP" display (GUI software pull down menu).
- SCA8X0-21X0-31X0 demo may not work properly if your PC has multiple USB serial ports installed. Please remove all other USB serial port devices.
- Close Windows HyperTerminal software, if you have used it.
- Check that USB driver LATENCY TIMER parameter is 5ms. Plug the demo USB cable in to PC and follow the steps (and screen captures) below:
  1. Open control panel and select "SYSTEM"
  2. Select "DEVICE MANAGER" from "HARDWARE" tab
  3. Select "USB SERIAL PORT" from the list, right mouse click and select "PROPERTIES"
  4. Select "ADVANVED" from the USB Serial port Properties
  5. Set the "LATENCY TIMER" to 5 ms (the 16ms default value is too slow for SCA8X0-21X0-31X0 DEMO KIT).
  6. Press "OK" to all windows.
  7. Restart the GUI software.

Start → Control panel




Device Manager
File Action View Help
FILT225
Batteries
Bluetooth
Computer
Disk drives
Display adapters
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
Jungo
Keyboards
Mice and other pointing devices
Modems
Monitors
Network adapters
PCMCIA adapters
Ports (COM & LPT)
Communications Port (COM1)
ECP Printer Port (LPT1)
Toshiba BT Port (COM10)
Toshiba BT Port (COM11)
Toshiba BT Port (COM12)
Toshiba BT Port (COM1
Toshiba BT Port (COM1
Toshiba BT Port (COM2
Toshiba BT Port (COM2
Toshiba BT Port (COM6)
Toshiba BT Port (COM7)
USB Serial Port (COM9)
Processors
Smart card readers
Sound, video and game controllers
System devices
Universal Serial Bus controllers
3.


USB Serial Port (COM9) Properties
General
Port Settings
Driver
Details
Bits per second: 9600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None
Advanced...
Restore Defaults
4.
OK
Cancel


Advanced Settings for COM9
COM Port Number: COM9
OK
Cancel
Defaults
USB Transfer Sizes
Select lower settings to correct performance problems at low baud rates.
Select higher settings for faster performance.
Receive (Bytes): 4096
Transmit (Bytes): 4096
BM Options
Select lower settings to correct response problems.
Latency Timer (msec): 5
Timeouts
Minimum Read Timeout (msec): 0
Minimum Write Timeout (msec): 0
Miscellaneous Options
Serial Enumerator
Serial Printer
Disable Modem Ctrl At Startup
5.

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